Read this document carefully before using this device. The guarantee will be expired by damaging of the device if you don't attend to the directions in the user manual. Also we don't accept any compensations for personal injury, material damage or capital disadvantages.

ENDA EPC4420 PID PROFILE CONTROLLER

Thank you for choosing ENDA EPC4420 profile controller.

CE RoHS Compliant

* 48 x 48mm sized.
* Selectable sensor type.
* Automatic calculation of PID parameters (SELF TUNE).
  Enter PID parameters of the system if they are known at the beginning. Otherwise, Self-Tune should be activated.
* Communication vai RS-485 ModBus protocol (Optional).
* Selectable SSR or relay control output.
* Selectable 0-20mA or 4-20mA analog control output.
* Relay output can be programmable as second alarm or control output.
* AL1 output or Timer output or can be used as control AL1 relay output.
* Selectable Heat/Cool control.
* Input offset feature.
* In the case of sensor failure periodical running or relay state can be selected.
* Until the eight steps to make the profile control.
* In each step AL1 and AL2 outputs proramming.
* To continue where it left off in power failure feature.
* For the keypad security levels.
* Programming by using keypad or Modbus.
* CE marked according to European Norms.

TECHNICAL SPECIFICATIONS

Input type	Temperature range °C	Temperature range °F	Accuracy
Pt 100 Resistance Thermometer EN 60751	-200...600 °C	-328... +1112°F	± 0,2% (of full scale) ± 1 digit
Pt 100 Resistance Thermometer EN 60751	-99.9...300.0°C	-99.9...+543.0°F	± 0,2% (of full scale) ± 1 digit
J (Fe-CuNi) Thermocouple EN 60584	0... 600°C	+32... +1112°F	± 0,2% (of full scale) ± 1 digit
K (NiCr-Ni) Thermocouple EN 60584	0...1200°C	+32... +2192°F	± 0,2% (of full scale) ± 1 digit
T (Cu-CuNi) Thermocouple EN 60584	0... 400°C	+32... +752°F	± 0,2% (of full scale) ± 1 digit
S (Pt/0Rh-Pt) Thermocouple EN 60584	0...1600°C	+32... +2912°F	± 0,2% (of full scale) ± 1 digit
R (Pt13Rh-Pt) Thermocouple EN 60584	0...1600°C	+32... +2912°F	± 0,2% (of full scale) ± 1 digit

ENVIRONMENTAL CONDITIONS	
Ambient/storage temperature	0 ... +50°C/-25... +70°C (with no icing)
Max. Relative humidity	80% up to 31°C decreasing linearly 50% at 40°C.
Rated pollution degree	According to EN 60529 Front panel : IP65 Rear panel : IP20
Height	Max. 2000m

Do not use the device in locations subject to corrosive and flammable gases.

ELECTRICAL CHARACTERISTICS	
Supply	230V AC +10% -20%, 50/60Hz or 24V AC ±10%, 50/60Hz.
Power consumption	Max. 5VA
Wiring	2.5mm² screw-terminal connections
Line resistance	For thermocouple max.100ohm, for 3 wired Pt 100 max. 20ohm
Data retention	EEPROM (minimum 10 years)
EMC	EN 61326-1: 1997, A1: 1998, A2: 2001 (Performance criterion B for standard EN 61000-4-3)
Safety requirements	EN 61010-1: 2001 (Pollution degree 2, overvoltage category II)

OUTPUTS	
CONT./AL2	Relay : 250V AC, 2A (for resistive load), NO/NC. Selectable as Control or Alarm2 output.
AL1	Relay : 250V AC, 2A (for resistive load), NO/NC selectable. (Alarm1 output).
ANL/SSR	Selectable logic control output. (Max. 12V, 20mA)
Life expectancy for relay	Mechanical 30.000.000 operation; Electrical 300.000 operation

CONTROL	
Control type	Single set-point and alarm control
Control algorithm	On-Off / P, PI, PD, PID (selectable)
A/D converter	15 bits
Sampling time	500ms
Proportional band	Adjustable between 0% and 100%. If Pb=0%, On-Off control is selected.
Integral time	Adjustable between 0.0 and 100.0 minutes
Derivative time	Adjustable between 0.00 and 25.00 minutes
Control period	Adjustable between 1 and 250 seconds
Hysteresis	Adjustable between 1 and 50°C/F
Output power	The ratio of power at a set point can be adjusted between 0% and 100%

HOUSING	
Housing type	Suitable for flush-panel mounting according to DIN 43 700.
Dimensions	W48xH48xD87mm
Weight	Approx. 250g (after packing)
Enclosure material	Self extinguishing plastics.

While cleaning the device, solvents (thinner, benzine, acid etc.) or corrosive materials must not be used.

SET / PSET — ASET

If SET/PSET key is pressed while holding ASET key, the programming mode is enabled.

Entering from the programming mode to the run mode:
If no key is pressed within 20 seconds during programming mode, the data is stored automatically and the run mode is entered.
Alternatively, the same function occurs first pressing ASET key and then pressing SET/PSET and ASET keys together.

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Con.o.

Pb = Proportional band.
Adjustable between 0% and 100%
Setting Pb = 0% On-Off control is selected.

t i = Integral time.
Adjustable between 0.0 and 100.0 minutes.
If t i = 0.0, integral effect is not used.
Setting Pb = 0 this parameter is not seen.

td = Derivative time.
Adjustable between 0.00 and 25.00 minutes.
If td = 0.00, derivation effect is not used.
Setting Pb = 0 this parameter is not seen.

Ct = Control period.
Adjustable between 1 and 250 seconds.
Setting Pb = 0 and C.ot.SA Out 1 this parameter is not seen.

P.SEt. = The ratio of output power at the set point.Adjustable between 0% and 100%.
If this parameter is set to 0, the output power becomes 0 at the set point. If it is adjusted to 50% output power becomes 50% at the set point. Using this parameter the energy requirements of the system is adjusted at the set point. So the set point can be achieved by minimum fluctuations and in the shortest time.
Setting Pb = 0, this parameter is not seen.

C.HYS. = Hysteresis of the control output.
Adjustable between 1 and 50 °C/F.
Adjustable between 0,1 and 50 °C/F ,if inP=Pt.0
Setting Pb = 0 this parameter is not seen.

C.StA. = Configuration of the control output.
C.StA. = HEAt means heating control.
C.StA. = cool means cooling control.

Pr.Er. = This parameter is used to adjust the control output during a sensor failure.
Adjustable between 0% and 100%.
If this parameter is adjusted to a value closer to the energy requirements of the system at the set point, process temperature is prevented to rise or drop to dangerous levels.

C.ot.S. = Type of control output
out 1 = Out1 control output.
0-20 = Analog control output.
(0mA %0 energy, 20mA %100 energy)
Out1 = Alarm2 output.
4-20 = Analog control output.
(4mA %0 energy, 20mA %100 energy)
Out1 = Alarm2 output.
SSr = SSR control output.
Out1=Alarm2 output.

C.Con. = Consistently control selection.
oFF = At the end of the profile, temperature control is turned off.
on = At the end of the profile, temperature is kept constant in last set value.

ALr.1

A1.HY. = Hysteresis of the Alarm1 output.
Adjustable between 1 and 50°C.

A1.tP. = Function of Alarm1 output.
Four kinds of functions can be selected.
indE. = Independent
dE. = Deviation
bAnd = Band
bAn i. = Band with inhibition
Prof = Profile of control during the current segment AL1 output according to program behaves.

A1.St. = The state of Alarm1.
If independent or deviation alarm is selected, this parameter can be Lo. and Hi. For Lo. alarm output is energized below the alarm set point. For Hi. alarm output is energized above the alarm set point. If band alarm is selected, this parameter can be biH i or boH i. biH i means alarm is activated inside the band.boH i means alarm is activated outside the band.

A1.P.E. = State of Alarm1 output in the case of sensor failure.
If A1.P.E.= On , the alarm output is energized during the sensor failure.
If A1.P.E.= oFF, the alarm output is not energized during the sensor failure.

A1.HL = Alarm1 value upper limit.
If inP. or Unit. parameters are changed, the maximum value of the A1.HL parameter changes to the maximum scale value of the selected input type. Minimum of A1.HL parameter is the value of A1.LL parameter.

A1.LL. = Alarm1 value lower limit.
If inP. or Unit. parameters are changed, the minimum value of the A1.LL parameter changes to the minimum scale value of the selected input type. The maximum value is the value of A1.HL parameter.

ALr.2

ATTENTION! If C.ot.S parameter is a .out 1 This MENU is not seen.

A2.HY. = Hysteresis of the Alarm2 output.
Adjustable between 1 and 50°C.

A2.tP. = Function of Alarm2 output.
Four kinds of functions can be selected.
indE. = Independent
dE. = Deviation
bAnd = Band
bAn i. = Band with inhibition
Prof = Profile of control during the current segment AL2 output according to program behaves.

A2.St. = The state of Alarm2.
If independent or deviation alarm is selected, this parameter can be Lo. and Hi. For Lo. alarm output is energized below the alarm set point. For Hi. alarm output is energized above the alarm set point. If band alarm is selected, this parameter can be biH i or boH i. biH i means alarm is activated inside the band.boH i means alarm is activated outside the band.
NOTE! If C.ot.S. = out 1, this parameter is not seen.

A2.P.E. = State of Alarm2 output in the case of sensor failure.
If A2.P.E.= On, the alarm output is energized during the sensor failure.
If A2.P.E.= oFF, the alarm output is not energized during the sensor failure.
NOTE! If C.ot.S. = out 1, this parameter is not seen.

A2.HL = Alarm2 value upper limit.
If inP. or Unit. parameters are changed, the maximum value of the A2.HL parameter changes to the maximum scale value of the selected input type. Minimum of A2.HL parameter is the value of A2.LL parameter.

A2.LL. = Alarm2 value lower limit.
If inP. or Unit. parameters are changed, the minimum value of the A2.LL parameter changes to the minimum scale value of the selected input type. The maximum value is the value of A2.HL parameter.
NOTE! If C.ot.S. = out 1, this parameter is not seen.

ConF.

inP. = Type of input and scale.
Pt = Pt 100 -200 to +600°C
Pt.0 = Pt 100 -99.0 to +300.0°C
FE.cn. = J (Iron vs. Copper-Nickel) 0 to +600°C
nCnA. = K (Nickel-Cr.vs. Nickel-Alum.) 0 to +1200°C
CCn. = T (Copper vs. Copper-Nickel) 0 to +400°C
P10r. = S (Platinum-10%Rhodium vs. Pt.) 0 to +1600°C
P13r. = R (Platinum-13%Rhodium vs. Pt.) 0 to +1600°C
Note : If the selected input type is changed, the value of CH.iL, C.LoL, AH.iL, A.LoL parameters changes automatically.

C.H.iL. = Set point upper limit.
If inP. or Unit. parameters are changed, the maximum value of the C.H.iL parameter changes to the maximum scale value of the selected input. The minimum value is the value of C.Lo.L. parameter.

C.Lo.L. = Set point lower limit.
If inP. or Unit. parameters are changed, the minimum value of the C.Lo.L. parameter changes to the minimum scale value of the selected input. The maximum value is the value of C.H.iL parameter.

oFFS. = Offset value.
Offset value is added to the measurement value.
Adjusted between -99 and +99°C.
The normal value is 0.

Unit. = The temperature unit.
Selectable as °C or °F.
Note : If the temperature unit is changed, the value of the UPL., LoL., A.UP.L., A.Lo.L. Parameters changes automatically.
NOTE! If inP parameter is selected TC or Pt100, this parameter is seen.

FLCo. = Coefficient of digital filter.
Filter for display value.
Adjustable between 1 and 32. If this parameter is 1, digital filter runs most quick. If the parameter is 31, the filter run most slow. The value of parameter should be increased in interference.

t.bAS. = Unit of time.
As SEC. or min can be selected.
SEC. is selected,the time as second is shown.
min. is selected, the time as minute is shown.

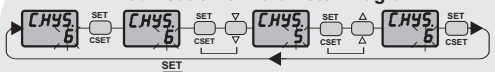
SE.iP. = Segment increasing parameter.
SE.iP. parameter can be set between the value in 0 and CH.iL parameters.
If Snun is selected between 1 and 8,the time value at the end of the process and the difference between the target temperature value of SE.iP. is equal to or smaller then the next segment is passed.
If the Snun = 0 is selected,the difference between target temperature with process value until from SE.iP value smaller than or equal ;timer is stopped and it does flash.

P.onE. = The selection of action that the energy is given.
If StoP is selected, the running program is stopped when power is cutted-off and came back ;is returned to beginning of the program.It is expected to run again.
If Cont. is selected, the power is cutted-off and came back; running program will continue where is resume.

S.nun. = Maximum segment number.
Can be selected between the 0-8. Selected numbers between 1-8,shows the step of program to work with.Can be selected "0" is passed to the thermostat and timer mode.In this mode the timer works when the temperature reached the set value at the end of this period and the Alarm1 contact be active.

d.SEL = Display selection parameter.
It can take values between the 1-10. Can be selected "1",only the process value is shown. 2 and the above values are selected ;If 2 or more is programmed segment profile, a segment number process value is shown alternately.

Modification of Parameter Diagram



When holding SET/CSET key,the value of parameter flashes and using ▲ ▼ keys the requested value can be adjusted.

If ▲ key is pressed and held 0.6 seconds,the value of the selected parameter changes rapidly.If waited enough,the value increases 100 at each step. After 1 second following the release of the key,initial condition is returned. The same prodecure is valid for the decrement key.

d.Adr. = Device address.
Adjustable between 1 and 247. Difference addresses should be selected for every device.

bAud = Modbus baud rate.
Selectable 1200, 2400, 4800 and 9600.
If bAud= oFF, Modbus communication will be disable.
Note: The parameter appears at the devices which become ModBus.

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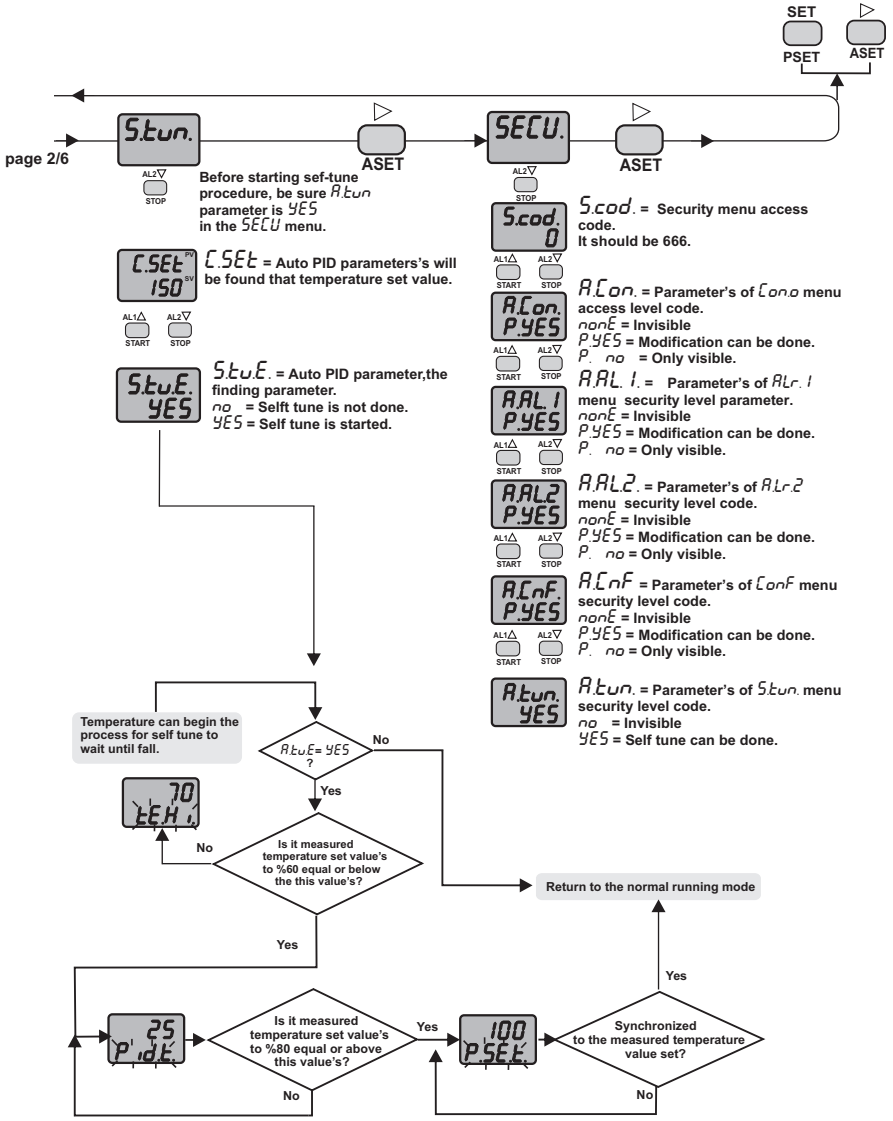
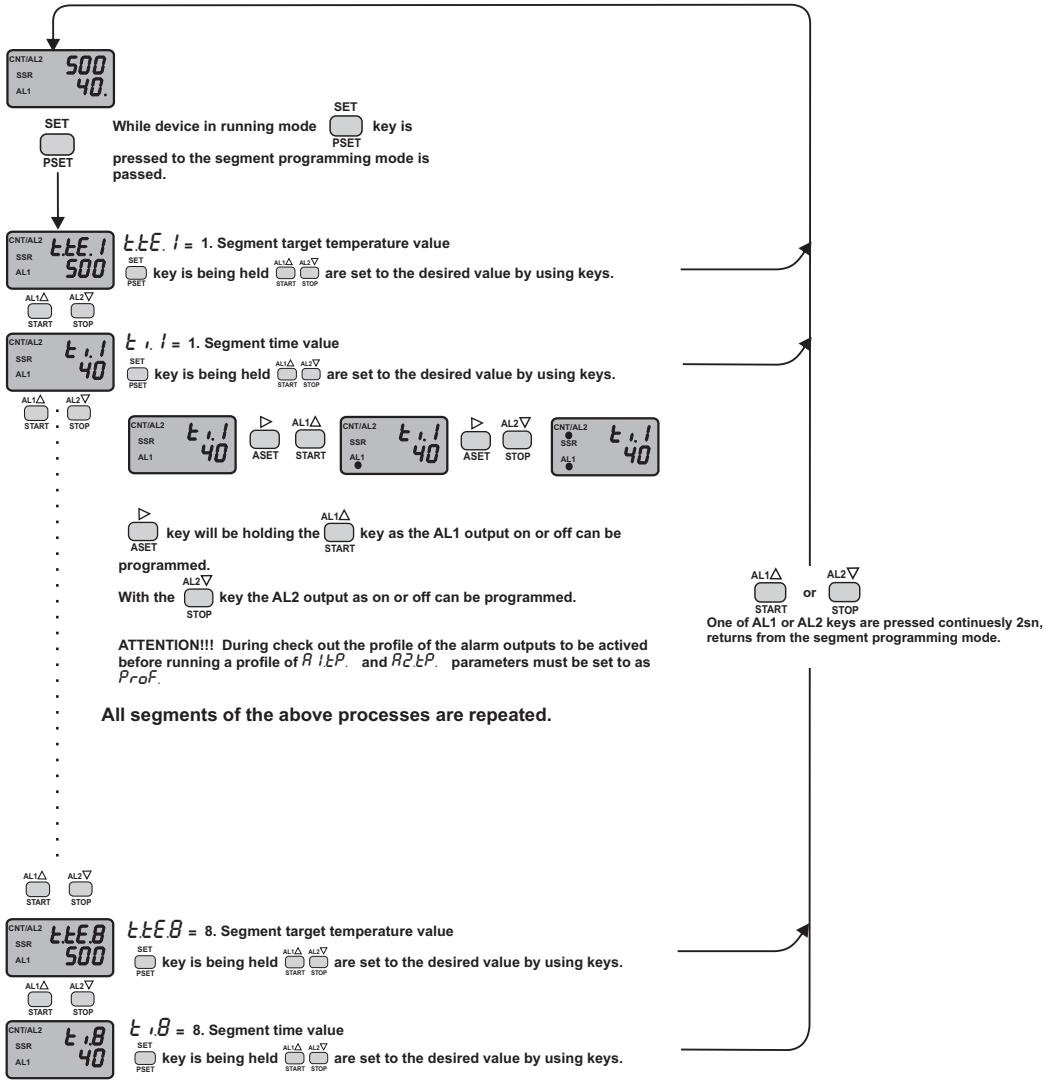

SET
PSET
ASET
S.tun.
SECU.
ASET
ASET
AL2▽ STOP
Before starting sef-tune procedure, be sure A.tun parameter is YES in the SECU menu.
S.cod. = Security menu access code. It should be 666.
C.SEt = Auto PID parameters's will be found that temperature set value.
A.Con. = Parameter's of Conp menu access level code.
nonE = Invisible
P.YES = Modification can be done.
P. no = Only visible.
S.tu.E. = Auto PID parameter,the finding parameter.
no = Selft tune is not done.
YES = Self tune is started.
A.AL.1. = Parameter's of ALr.1 menu security level parameter.
nonE = Invisible
P.YES = Modification can be done.
P. no = Only visible.
A.AL.2. = Parameter's of ALr.2 menu security level code.
nonE = Invisible
P.YES = Modification can be done.
P. no = Only visible.
A.CnF. = Parameter's of ConF menu security level code.
nonE = Invisible
P.YES = Modification can be done.
P. no = Only visible.
A.tun. = Parameter's of S.tun. menu security level code.
no = Invisible
YES = Self tune can be done.
Temperature can begin the process for self tune to wait until fall.
A.tu.E= YES ?
No
Yes
70
tEH.1
No
Is it measured temperature set value's to %60 equal or below the this value's?
Return to the normal running mode
Yes
25
P.id.t
Is it measured temperature set value's to %80 equal or above this value's?
Yes
100
P.SE.t
Synchronized to the measured temperature value set?
Yes
No
No

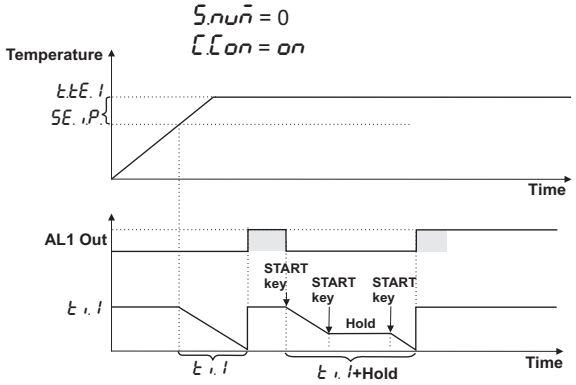
Probe error is not,to the self tune mode is entered.The measured temperature is low enough to make that self tune,P.id.t. message is seen in sub-indicator and the self tune process starts.For the self tune process to begin,measured temperature must be to % 60 equal or under the set value's.If this condition is not right , in the sub-indicator tEH.1. message flashes and the device can make self tune waits until the temperature falls.When the temperature decreased, P.id.t. message starts to flash in the sub-indicator and self tune process is started and PID parameters can be calculated until possible in the sub-indicator of this message continues to flash. After PID parameters found in the sub-indicator P.SE.t. message starts to flash. In this case,device PID controlled the heating till the set value and finding the reqired amount of energy for being stabilished on the set level heating; returned quitting the self tune mode and writing the P.SE.t. parameter as %.

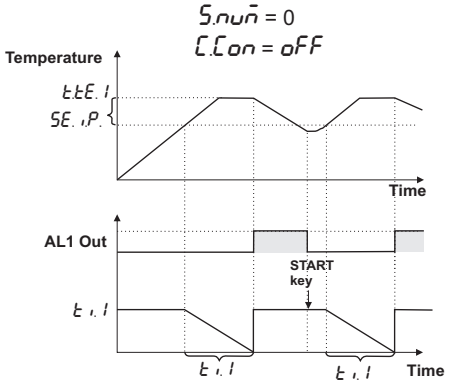
If pressed on any keys while the P.id.t. message flashes on sub-indicator, self tune mode is quitted without accounting display PID parameters.

SEGMENTS OF PROGRAMMING

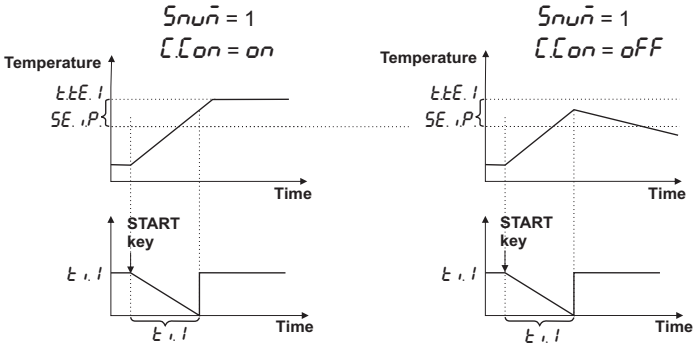

CNT/AL2
SSR
AL1
500
40.
SET
PSET
While device in running mode SET PSET key is pressed to the segment programming mode is passed.
t.tE.1 = 1. Segment target temperature value
SET PSET key is being held AL1△ START AL2▽ STOP are set to the desired value by using keys.
t.1.1 = 1. Segment time value
SET PSET key is being held AL1△ START AL2▽ STOP are set to the desired value by using keys.
t.1.1
40
ASET
START
STOP
ASET key will be holding the AL1△ START key as the AL1 output on or off can be programmed.
With the AL2▽ STOP key the AL2 output as on or off can be programmed.
ATTENTION!!! During check out the profile of the alarm outputs to be actived before running a profile of A1.tP. and A2.tP. parameters must be set to as ProF.
All segments of the above processes are repeated.
t.tE.8 = 8. Segment target temperature value
SET PSET key is being held AL1△ START AL2▽ STOP are set to the desired value by using keys.
t.1.8 = 8. Segment time value
SET PSET key is being held AL1△ START AL2▽ STOP are set to the desired value by using keys.
AL1△ START or AL2▽ STOP
One of AL1 or AL2 keys are pressed continuesly 2sn, returns from the segment programming mode.

TIMER / THERMOSTAT OUTPUT EXAMPLES





PROFILE CONTROL OUTPUT EXAMPLES

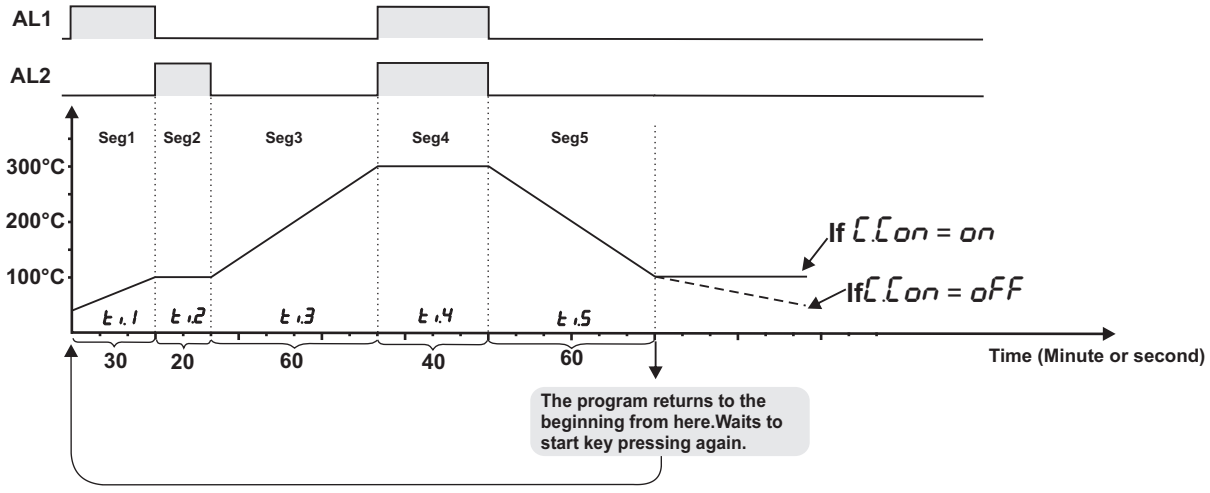


For single-step program S.nuM should be "1".

MULTI-STEP PROFILE CONTROL OUTPUT EXAMPLES

	Seg1	Seg2	Seg3	Seg4	Seg5
Target Temperature	ttE. 1 = 100	ttE.2 = 100	ttE.3 =300	ttE.4 = 300	ttE.5 = 100
Time	t i. 1 = 30	t i.2 = 20	t i.3 = 60	t i.4 = 40	t i.5 = 60
AL1	ON	OFF	OFF	ON	OFF
AL2	OFF	ON	OFF	ON	OFF

For five-step program S.nuM should be "5".



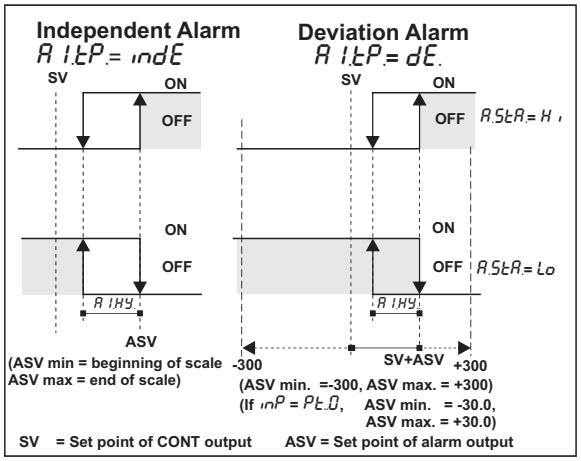
TERMS

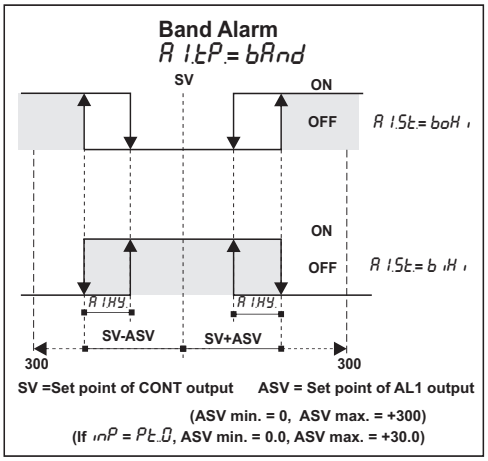
(7)

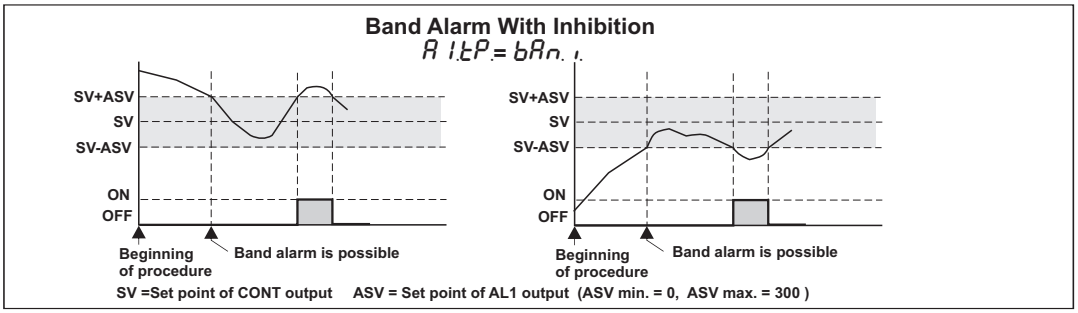
(1) Measurement value (At running mode)
Parameter name (At programming mode)
(2) Set value (At running mode)
Parameter value (At programming mode)
Timer run LED
(3) Value increment key (At running and programming mode)
START key (At running mode)
Parameter selection key (At programming mode)
(4) Value decrement key (At running and programming mode)
STOP key (At profile programming mode)
If only this key is pressed in running mode,software version number is seen.
Parameter selection key (At programming mode)
(5) Alarm set key (At running mode)
Menu selection key (At programming mode)
(6) The profile set values adjustment key (At running mode)
Parameter set key (At programming mode)

(1) PV display	4 digits 7 segment red LED
(2) TIMER display	4 digits 7 segment yellow LED
Character heights	PV display : 7mm
	TIMER display :7mm
(3),(4),(5),(6) Keypad	Mikro switch
(7) State indicator	3 red LEDs for Control, Alarm1 and SSR outputs

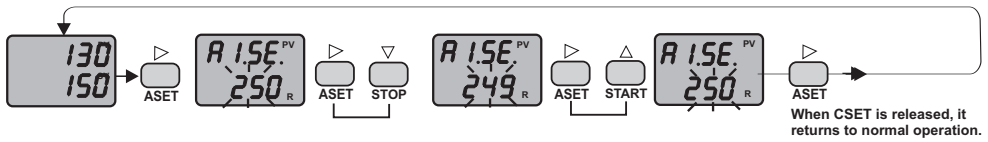
ALARM1 AND ALARM2 OUTPUT TYPES







MODIFICATION OF CONTROL AND ALARM SET POINTS



First, press and hold ASET key, alarm setpoint value appears on the display. Then, the value is adjusted by using START STOP keys.

If C.ot.S different from out 1. Alarm1 and Alarm2 setpoint values can be adjusted in sequence when per press ASET key.

NOTE: The maximum of C.SEt is the value of C.H ıL. parameter and the minimum of it is the value of C.Lo.L. parameter.
If independent alarm is selected, A 1.SE. and A2.SE. values can be adjusted between the limits of the full scale.
If deviation alarm is selected, A 1.SE. and A2.SE. values can be adjusted between -300 and +300.
If band alarm is selected, A 1.SE. and A2.SE. values can be adjusted between 0 and +300.

Error Messages

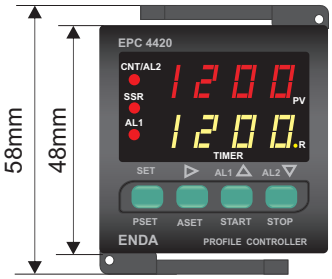
Temperature value is higher than the scale

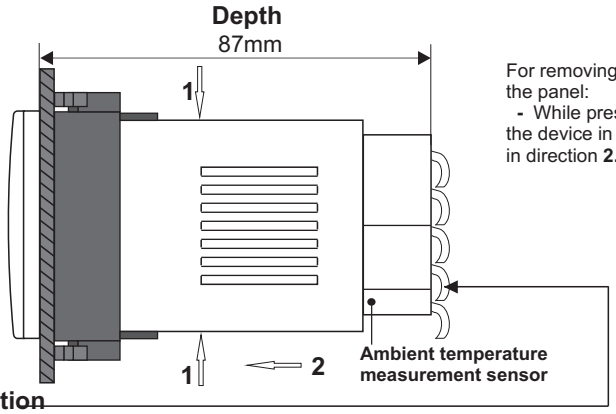
Temperature value is lower than the scale

Temperature sensor is broken or over temperature

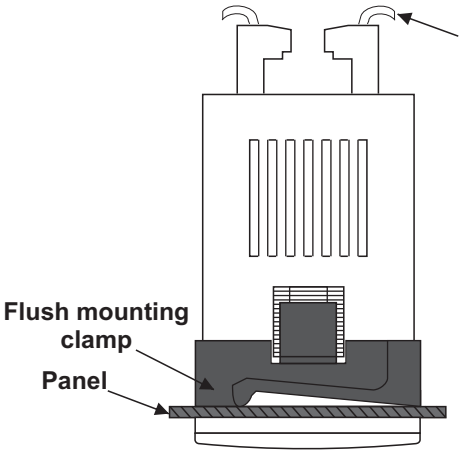
Pt 100 or a sensor line is short circuited

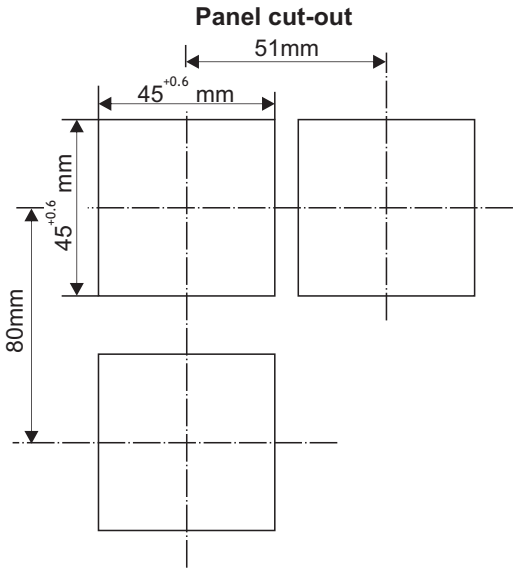
DIMENSIONS





For removing the device from the panel:
- While pressing both side of the device in direction **1**, push it in direction **2.**

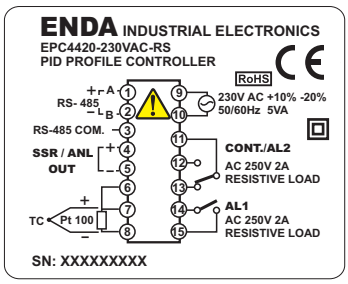


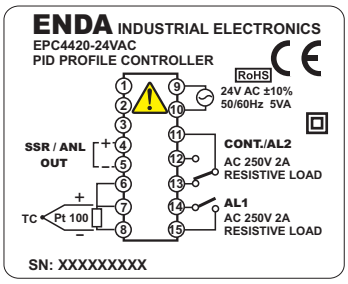


Note 1) While panel mounting, additional distance required for connection cables should be considered.
2) Panel thickness should be maximum 9mm.
3) If there is no 100mm free space at back side of the device, it would be difficult to remove it from the panel.

CONNECTION DIAGRAM

ENDA EPC4420 is intended for installation in control panels. Make sure that the device is used only for intended purpose. The shielding must be grounded on the instrument side. During an installation, all of the cables that are connected to the device must be free of energy. The device must be protected against inadmissible humidity, vibrations, severe soiling and make sure that the operation temperature is not exceeded. All input and output lines that are not connected to the supply network must be laid out as shielded and twisted cables. These cables should not be close to the power cables or components. The installation and electrical connections must be carried on by a qualified staff and must be according to the relevant locally applicable regulations.



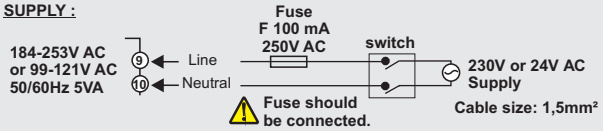


Logic output of the instrument is not electrically insulated from the internal circuits. Therefore, when using a grounding thermocouple, do not connect the logic output terminals to the ground.

Note 1) Mains supply cords shall meet the requirements of IEC 60227 or IEC 60245.
2) In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument and it should be easily accessible by the operator.

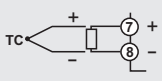
NOTE :

SUPPLY :

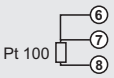


SENSOR INPUT :

For J-K-T-S-R type thermocouple :
Use suitable compensation cables. Don't use jointed cables. Pay attention to the polarities of the thermocouple cables as shown in the figure right are connected to the .



For resistance thermometer :
When 2 wired Pt 100 is used, terminals 6 and 7 must be short circuited.



Holding screw
0.4-0.5Nm

Equipment is protected throughout by DOUBLE INSULATION.

Order Code : EPC4420-□□□□□□-□□
1 2

1 - Supply Voltage
230VAC...230V AC
24VAC.....24V AC
SM.....9-30V DC / 7-24V AC

2- Modbus Option
RS.....RS-485 Modbus communication
None....Don't support RS-485 Modbus communication

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